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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/072,362

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Kuan-Yu Fu

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04/05/2004

J.C. Patents

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EXAMINER

HU, SHOUXIANG

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 04/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/072,362

Applicant(s)

FU, KUAN-YU

Examiner

Shouxiang Hu

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. 09/059,548.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Drawings

1. The proposed drawing changes filed on 1-28-2004 are objected to because the proposed changes made to Fig. 4D lack an adequate support from the original disclosure. Applicant intends to separate the shallow doped region 304 from the deeply doped source/drain region 306 in order to support applicant's assertion that the two regions are formed with two different types of dopants. However, what shown in Fig. 4D and in Fig. 2G are from two different embodiments and viewed from two different dimensions. And, the original disclosure lacks an adequate description regarding the subject matters that the two regions (304 and 306) are distinguishable from each other with a defined boundary therebetween along the defined dimension defined in Fig. 4D and they are formed of two different types of dopants (also see the claim rejections under 35 U.S.C. 112 set forth below in this Office action).

A drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 10-12 and 17-18 are objected to because of the following informalities and/or defects:

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In claim 10, the terms of "said first and second trench profile" lacks a sufficient antecedent basis in the claim.

In claim 17-18, the term of "the thick insulating layer" lacks a sufficient antecedent basis in the claims, as the like term is already deleted from claim 16.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13-18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 13 and 16 each recite the subject matter that the deep source/drain regions are doped with dopants of a conductivity type different from that in the first and second shallow doped regions, but according to the original disclosure, the deep and shallow regions both function as a source/drain region, which requires that they have a same conductivity type, so as to effectively increase the gate width. It is not clear how the device would still be functional if the deep and shallow regions are formed of dopants of different conductivity types.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 10 and 12, 13, 15, 16 and 18, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 102(b) as being anticipated by Lancaster (US 4,835,584).

Lancaster discloses a semiconductor structure (Figs. 1-7F, especially Figs. 4, 5L, and/or 7F), comprising a substrate having an active region including a channel region (under each bottom of the gate oxide layer 57 in Fig. 5L or 72 in Fig. 7F) and a non-channel region surrounding the channel region; a first trench and a second trench disposed near the channel region, a thick insulating layer (57 in Fig. 5L or 72 in Fig. 7F; a silicon oxide gate insulating layer, about 0.1 um, see col. 3, line 61) over the first and second trenches and conformal to the profile of the first and second trenches; a gate electrode (58 in Fig. 5L or 75 in Fig. 7F) disposed over the two trenches and comprising a first vertical portion, a second vertical portion and a horizontal portion, with the first vertical portion being embedded inside and substantially fills the first trench, the second vertical portion being embedded inside and substantially fills the second trench, and the horizontal portion being disposed over the substrate and connecting the first and second vertical portions together; a first shallow doped region (the top horizontal portion of region 73 or 77) within the substrate at an upper corner adjacent to the first vertical

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portion of the gate electrode and a second shallow doped region (the upper horizontal portion of region 74 or 78) at an upper corner adjacent to the second vertical portion of the gate electrode; a deep source region (the lower portion of region 73 or 77) and a deep drain region (the lower portion of region 74 or 78) disposed in a region in the substrate at a depth deeper than the first and second trenches.

Regarding claims 10-12, it is noted that the gate electrode in Lancaster naturally completely fills a remaining portion (as one of the remaining portions) of the first and second trenches because: (A) after portions of the two trenches being filled with the thick insulating layer, the remain of the two trenches can be regarded as being formed of a plurality of remaining portions (note: the term of "a remaining portion" differs in scope from the term of "the remaining portion"); and/or (B) the combination of the layer 75 and the layer 57 in Fig. 5L or the combination of the layer 72 and the lower portion of layer 80 in Fig. 7F of Lancaster is readable as recited thick insulating layer, as the rejected claims lack sufficient limitations to further define the features of the recited "thick insulating layer".

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 11, 14 and 17, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Lancaster (US 4,835,584) in view of Kimura (US 5029,321).

The disclosure of Lancaster is discussed as applied to claims 10 and 12, 13, 15, 16 and 18 above.

Although Lancaster does not expressly disclose that the thick insulating layer can be formed through thermal oxidation, one of ordinary skill in the art would readily recognize that such thick insulating layer used as a gate oxide layer can be readily formed through thermal oxidation for achieving high quality in the gate insulating layer, as evidenced in Kimura (see the thermal oxide layer 3 in Fig. 7E).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the semiconductor structure of Lancaster with the thick insulating layer (the gate oxide layer) being formed through thermal oxidation, as taught in Kimura, so that a semiconductor device with a high quality gate insulting layer would be obtained.

Response to Arguments

6. Applicant's arguments filed on 01-28-2004 have been fully considered but they are not persuasive. And, the response to these arguments has been fully incorporated into the claims rejections, especially the claim rejections under 35 U.S.C. 102 and 112, set forth in this office action.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
April 1, 2004



SHOUXIANG HU
PRIMARY EXAMINER